

appendix E

1950s–1990s Chesapeake Bay and Tidal Tributary Chlorophyll a Concentrations by Chesapeake Bay Program Segment

HISTORICAL DATA SETS

The earliest water quality data in the Chesapeake Bay Program data base date from the early 1950s. Thus, the historical era referred to here extends from the early 1950s to 1984, when the coordinated baywide Chesapeake Bay Monitoring Program began. Most of the early studies focused on the physical and chemical characterization of tidal waters. Sometimes measurements of phosphorus species, usually orthophosphate, and chlorophyll *a* were taken. The impetus for more nutrient measurements came during the 1960s (possibly exacerbated by the severe drought in that decade) and 1970s with the increasing awareness of the Chesapeake Bay's eutrophication and other signs of degradation. Nitrate measurements were collected more frequently, and measurements of a larger suite of phosphorus and nitrogen species began to be collected. Estimates of total phosphorus and total nitrogen are infrequent in the historical data, however.

Data from the Johns Hopkins University Chesapeake Bay Institute and the U.S. Environmental Protection Agency's Annapolis Field Office constitute the largest contributions to the historical database. Maryland and Virginia state monitoring programs provided data from various state waters. In Virginia, other major contributors to the historical database were the Virginia Institute of Marine Science and the Virginia State Water Control Board slack water surveys. The database also includes many smaller data sets including, among others, data from University of Maryland researchers and from environmental impact studies of electric power generation in Maryland.

Historical to present chlorophyll *a* concentration data are presented by Chesapeake Bay Program segment within decades (1950s-1990s) in Table E-1. Table E-2 presents the same chlorophyll *a* data by Chesapeake Bay Program segment across the same decades.

BENCHMARK CHLOROPHYLL A DATA ASSESSMENT

The historical and current monitoring data sets (through 1999) were pooled, and the surface (sampling depth \leq 1.5 meters) values of the parameters were retained. Each data point was associated with a segment (from the original Chesapeake Bay Program segmentation scheme) and a salinity regime. Salinity regimes were defined as: tidal-fresh 0-0.5 ppt; oligohaline >0.5-5.0 ppt; mesohaline > 5-18 ppt and polyhaline >18 ppt.

If a salinity measurement was associated with the value, then that measurement determined the regime. Otherwise, the regime was assumed from the median salinity of the segment in which the measurement was taken. Values were further identified according to decade (1950s through 1990s) and season. The seasons that were included were: annual (January through December), spring (March, April and May) and summer (June, July, August and September).

The individual data values were assessed using the Chesapeake Bay Program method for calculating relative status (Alden and Perry 1997). The method uses the logistic distribution of values in a reference data set to assess values in a test data set. The procedure yields a score between 0 and 100 for each test value. The reference data, in this case, were Chesapeake Bay Program Water Quality Monitoring data from 1985 through 1990, which includes the largest number of stations and greatest seasonal coverage of the monitoring program's history to date. It thus provided the best available spatial and temporal coverage of the historical record. The time period also represented a relatively wide variety of flow and other climatic conditions, although none was particularly extreme.

The reference and test data sets were similarly partitioned by depth, segment, salinity zone and season. For each reference grouping, the logistic distribution of values was obtained and cutoff points representing the upper, middle and lower thirds of the distribution were determined. For nitrogen, phosphorus, chlorophyll *a* and suspended solids, high values are undesirable, therefore, the cutoff points represented 'poor', 'fair' and 'good' quality conditions, respectively, in this context. The status procedure scored each test value between 0 and 100, based on the distribution of the complementary reference distribution. Then, for each parameter/segment/salinity zone/decade/season, the median score was calculated for each calendar month, from which the median score for the season was obtained. The season median scores were categorized as 'good', 'fair' or 'poor' by using the reference cutoff points and adjusted slightly for the number of observations in the test data.

Each segment/zone/decade/season was then evaluated as representing 'healthy' nutrient and sediment levels. To qualify, none of the critical parameters—total nitrogen, total phosphorus, chlorophyll *a* or total suspended solids—could have a 'poor' assessment; only one parameter could have a 'fair' assessment and one or more parameters had to be 'good'. Benchmark levels for each parameter were then derived from this set of reference locations by extracting the values only from the

reference locations in which the parameter of interest was assessed as ‘good’. These values were then pooled by salinity regime and decade and, ultimately, by salinity regime alone.

LITERATURE CITED

Alden, R. W. III and E. S. Perry 1997. *Presenting Measurements of Status: Report to the Chesapeake Bay Program Monitoring Subcommittee’s Data Analysis Workgroup*. Chesapeake Bay Program, Annapolis, Maryland.

Table E-1. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by Chesapeake Bay Program segment within decade: 1950s–1990s.

| Decade | Chesapeake Bay Program Segment | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|--------|--------------------------------|-------------|-----|-------------|-----|-------------|-----|
| 1950 | Northern Chesapeake Bay | — | — | — | — | 1.4 | 1 |
| | Upper Chesapeake Bay | 1.1 | 1 | — | — | 2.2 | 7 |
| | Upper Central Chesapeake Bay | — | — | 1.7 | 1 | 3.2 | 10 |
| | Middle Central Chesapeake Bay | 3.1 | 3 | 2.1 | 1 | 4.0 | 13 |
| | Lower Chesapeake Bay | 14.1 | 3 | 5.6 | 1 | 7.0 | 16 |
| | Western Lower Chesapeake Bay | — | — | — | — | 0.7 | 8 |
| | Eastern Lower Chesapeake Bay | 7.9 | 3 | — | — | 4.2 | 19 |
| | Mouth of the Chesapeake Bay | — | — | — | — | 1.6 | 8 |
| | Outside of Ches. Bay Mouth | — | — | 2.0 | 1 | 2.2 | 2 |
| | Northeast River | — | — | — | — | — | — |
| | Elk/Bohemia Rivers | — | — | — | — | — | — |
| | Sassafras River | — | — | — | — | — | — |
| | Chester River | — | — | — | — | — | — |
| | Eastern Bay | — | — | 0.5 | 1 | 1.5 | 3 |
| | Choptank River | 2.4 | 2 | 3.4 | 3 | 2.8 | 7 |
| | Lower Choptank River | 6.9 | 1 | 1.7 | 3 | 2.6 | 5 |
| | Nanticoke River | — | — | — | — | — | — |
| | Wicomico River | — | — | — | — | — | — |
| | Manokin River | — | — | — | — | — | — |
| | Big Annemessex River | — | — | — | — | — | — |
| | Tangier Sound | — | — | 11.8 | 1 | 4.3 | 8 |
| | Pocomoke River | — | — | — | — | — | — |
| | Bush River | — | — | — | — | — | — |
| | Gunpowder River | — | — | — | — | — | — |
| | Middle River | — | — | — | — | — | — |

Table E-1. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by Chesapeake Bay Program segment within decade: 1950s–1990s (continued).

| Decade | Chesapeake Bay Program Segment | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|--------|--------------------------------|-------------|-----|-------------|-----|-------------|-----|
| 1950 | Back River | — | — | — | — | — | — |
| | Patapsco River | — | — | — | — | 7.5 | 1 |
| | Magothy River | — | — | — | — | — | — |
| | Severn River | — | — | — | — | — | — |
| | South/Rhode/West Rivers | — | — | — | — | — | — |
| | Upper Patuxent River | 2.6 | 1 | 1.7 | 2 | 1.7 | 4 |
| | Middle Patuxent River | — | — | 2.1 | 2 | 2.9 | 3 |
| | Lower Patuxent River | 5.3 | 3 | 3.3 | 4 | 2.6 | 14 |
| | Upper Potomac River | — | — | — | — | — | — |
| | Middle Potomac River | — | — | 26.7 | 1 | 26.7 | 1 |
| | Lower Potomac River | 10.8 | 2 | 5.0 | 12 | 6.1 | 23 |
| | Upper Rappahannock River | — | — | — | — | — | — |
| | Middle Rappahannock River | — | — | — | — | 3.7 | 2 |
| | Lower Rappahannock River | 8.2 | 1 | — | — | 4.3 | 6 |
| | Upper York River | — | — | — | — | — | — |
| | Middle York River | — | — | — | — | 2.0 | 1 |
| | Lower York River | 4.5 | 1 | — | — | 1.8 | 3 |
| | Mobjack Bay | — | — | — | — | 0.6 | 2 |
| | Upper James River | — | — | — | — | — | — |
| | Middle James River | — | — | — | — | — | — |
| | Lower James River | — | — | 3.3 | 19 | 2.3 | 28 |
| 1960 | Northern Chesapeake Bay | 6.1 | 8 | 18.2 | 11 | 12.4 | 31 |
| | Upper Chesapeake Bay | 7.0 | 10 | 25.9 | 15 | 15.9 | 42 |
| | Upper Central Chesapeake Bay | 6.9 | 29 | 18.2 | 59 | 11.5 | 122 |
| | Middle Central Chesapeake Bay | 3.9 | 18 | 11.1 | 25 | 7.4 | 69 |
| | Lower Chesapeake Bay | 2.4 | 7 | 10.9 | 12 | 9.7 | 28 |

Table E-1. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by Chesapeake Bay Program segment within decade: 1950s–1990s (continued).

| Decade | Chesapeake Bay Program Segment | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|--------|--------------------------------|-------------|-----|-------------|-----|-------------|-----|
| 1960 | Western Lower Chesapeake Bay | — | — | — | — | — | — |
| | Eastern Lower Chesapeake Bay | 5.5 | 1 | 1.2 | 2 | 2.0 | 5 |
| | Mouth of the Chesapeake Bay | — | — | — | — | — | — |
| | Outside the Ches. Bay Mouth | 1.1 | 2 | 0.8 | 4 | 1.0 | 8 |
| | Northeast River | — | — | — | — | — | — |
| | Elk/Bohemia Rivers | — | — | — | — | — | — |
| | Sassafras River | — | — | 18.1 | 3 | 20.8 | 5 |
| | Chester River | 5.2 | 11 | 8.7 | 14 | 5.6 | 36 |
| | Eastern Bay | 5.3 | 27 | 9.2 | 39 | 6.5 | 94 |
| | Choptank River | — | — | — | — | — | — |
| | Lower Choptank River | — | — | — | — | — | — |
| | Nanticoke River | — | — | — | — | — | — |
| | Wicomico River | — | — | — | — | — | — |
| | Manokin River | — | — | — | — | — | — |
| | Big Annemessex River | — | — | — | — | — | — |
| | Tangier Sound | — | — | — | — | — | — |
| | Pocomoke River | — | — | — | — | — | — |
| | Bush River | — | — | — | — | — | — |
| | Gunpowder River | — | — | — | — | — | — |
| | Middle River | — | — | — | — | — | — |
| | Back River | — | — | 7.7 | 1 | 30.9 | 3 |
| | Patapsco River | 18.7 | 17 | 47.1 | 41 | 41.9 | 64 |
| | Magothy River | 8.6 | 13 | 12.5 | 21 | 11.5 | 56 |
| | Severn River | 7.1 | 12 | 15.9 | 22 | 10.8 | 60 |
| | South/Rhode/West Rivers | 6.3 | 17 | 15.4 | 38 | 11.1 | 73 |

Table E-1. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by Chesapeake Bay Program segment within decade: 1950s–1990s (continued).

| Decade | Chesapeake Bay Program Segment | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|-----------------------------|--------------------------------|-------------|-----|-------------|-----|-------------|-----|
| 1960 | Upper Patuxent River | 20.1 | 18 | 32.0 | 43 | 22.5 | 65 |
| | Middle Patuxent River | 15.0 | 2 | 24.8 | 4 | 21.5 | 6 |
| | Lower Patuxent River | 19.9 | 2 | 20.5 | 4 | 20.3 | 6 |
| | Upper Potomac River | 24.3 | 50 | 59.1 | 81 | 38.7 | 176 |
| | Middle Potomac River | 8.1 | 26 | 29.3 | 35 | 23.6 | 83 |
| | Lower Potomac River | 8.5 | 24 | 18.7 | 33 | 13.7 | 76 |
| | Upper Rappahannock River | — | — | — | — | — | — |
| | Middle Rappahannock River | — | — | — | — | — | — |
| | Lower Rappahannock River | — | — | — | — | — | — |
| | Upper York River | — | — | — | — | — | — |
| | Middle York River | — | — | — | — | — | — |
| | Lower York River | — | — | — | — | — | — |
| | Mobjack Bay | — | — | — | — | — | — |
| | Upper James River | — | — | — | — | — | — |
| 1970 | Middle James River | — | — | — | — | — | — |
| | Lower James River | 12.8 | 2 | — | — | 12.8 | 2 |
| | Northern Chesapeake Bay | 11.7 | 28 | 19.3 | 66 | 12.1 | 116 |
| | Upper Chesapeake Bay | 9.6 | 26 | 15.4 | 66 | 10.6 | 125 |
| | Upper Central Chesapeake Bay | 14.2 | 156 | 20.7 | 266 | 14.8 | 589 |
| | Middle Central Chesapeake Bay | 11.5 | 99 | 10.5 | 142 | 9.7 | 325 |
| | Lower Chesapeake Bay | 11.5 | 29 | 7.7 | 35 | 8.1 | 94 |
| | Western Lower Chesapeake Bay | — | — | 11.0 | 1 | 11.0 | 1 |
| | Eastern Lower Chesapeake Bay | 14.7 | 13 | 4.8 | 17 | 7.3 | 45 |
| | Mouth of the Chesapeake Bay | 14.8 | 4 | 7.7 | 14 | 8.7 | 29 |
| Outside the Ches. Bay Mouth | 5.1 | 7 | 3.5 | 8 | 4.2 | 31 | |
| | Northeast River | 40.0 | 11 | 54.9 | 35 | 49.0 | 53 |

Table E-1. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by Chesapeake Bay Program segment within decade: 1950s–1990s (continued).

| Decade | Chesapeake Bay Program Segment | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|--------|--------------------------------|-------------|-----|-------------|-----|-------------|-----|
| 1970 | Elk/Bohemia Rivers | 27.3 | 62 | 28.8 | 136 | 25.9 | 248 |
| | Sassafras River | 42.2 | 26 | 43.1 | 61 | 46.8 | 106 |
| | Chester River | 18.2 | 42 | 25.6 | 84 | 22.7 | 159 |
| | Eastern Bay | 6.5 | 84 | 21.7 | 89 | 14.0 | 226 |
| | Choptank River | 18.4 | 99 | 17.1 | 121 | 18.8 | 276 |
| | Lower Choptank River | 11.1 | 37 | 21.5 | 60 | 17.2 | 103 |
| | Nanticoke River | 32.5 | 37 | 22.9 | 80 | 26.7 | 168 |
| | Wicomico River | 36.7 | 31 | 41.9 | 42 | 31.4 | 101 |
| | Manokin River | 15.5 | 3 | 7.2 | 5 | 12.2 | 8 |
| | Big Annemessex River | — | — | 18.2 | 6 | 18.2 | 6 |
| | Tangier River | 20.3 | 37 | 16.6 | 57 | 27.6 | 113 |
| | Pocomoke River | 23.1 | 43 | 19 | 63 | 19.9 | 146 |
| | Bush River | 7.3 | 4 | 13.2 | 12 | 10.1 | 25 |
| | Gunpowder River | 7.6 | 24 | 7.3 | 39 | 9.7 | 94 |
| | Middle River | 14.7 | 8 | 28.2 | 8 | 17.7 | 19 |
| | Back River | 55.7 | 115 | 61.5 | 167 | 58.3 | 392 |
| | Patapsco River | 14.1 | 36 | 40.9 | 77 | 23.4 | 162 |
| | Magothy River | 33.8 | 40 | 37.8 | 50 | 32.7 | 129 |
| | Severn River | 22.2 | 12 | 32.1 | 43 | 24.8 | 75 |
| | South/Rhode/West Rivers | 25.2 | 31 | 29.7 | 84 | 29.4 | 157 |
| | Upper Patuxent River | 10.9 | 37 | 15.8 | 68 | 14.3 | 147 |
| | Middle Patuxent River | 31.3 | 2 | 18.1 | 8 | 16.8 | 14 |
| | Lower Patuxent River | 10.9 | 4 | 15.7 | 5 | 11.5 | 12 |
| | Upper Potomac River | 17.9 | 142 | 31.0 | 286 | 18.0 | 559 |
| | Middle Potomac River | 20.0 | 78 | 19.3 | 142 | 16.6 | 288 |

Table E-1. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by Chesapeake Bay Program segment within decade: 1950s–1990s (continued).

| Decade | Chesapeake Bay Program Segment | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|--------|--------------------------------|-------------|-----|-------------|-----|-------------|-----|
| 1970 | Lower Potomac River | 8.0 | 40 | 8.9 | 65 | 11.2 | 140 |
| | Upper Rappahannock River | 2.1 | 66 | 9.4 | 142 | 5.7 | 313 |
| | Middle Rappahannock River | 6.4 | 13 | 6.6 | 29 | 5.6 | 65 |
| | Lower Rappahannock River | 6.8 | 14 | 8.0 | 35 | 7.5 | 76 |
| | Upper York River | 3.9 | 18 | 9.8 | 107 | 7.2 | 170 |
| | Middle York River | 5.0 | 24 | 9.8 | 109 | 7.2 | 167 |
| | Lower York River | 7.8 | 8 | 5.7 | 21 | 5.8 | 35 |
| | Mobjack Bay | 8.3 | 16 | 7.4 | 42 | 6.5 | 69 |
| | Upper James River | 5.5 | 55 | 8.9 | 187 | 5.2 | 345 |
| | Middle James River | 7.7 | 19 | 4.6 | 75 | 4.6 | 137 |
| | Lower James River | 7.6 | 9 | 3.8 | 43 | 3.6 | 73 |
| 1980 | Northern Chesapeake Bay | 7.6 | 20 | 10.9 | 28 | 7.8 | 68 |
| | Upper Central Chesapeake Bay | 8.4 | 38 | 10.1 | 55 | 7.3 | 135 |
| | Upper Central Chesapeake Bay | 11.5 | 87 | 14.7 | 152 | 10.7 | 362 |
| | Middle Central Chesapeake Bay | 10.4 | 155 | 10.7 | 225 | 9.4 | 590 |
| | Lower Chesapeake Bay | 10.3 | 111 | 9.0 | 158 | 8.6 | 454 |
| | Western Lower Chesapeake Bay | 7.2 | 60 | 8.7 | 80 | 7.6 | 236 |
| | Eastern Lower Chesapeake Bay | 6.2 | 140 | 5.8 | 187 | 6.5 | 543 |
| | Mouth of the Chesapeake Bay | 5.8 | 45 | 4.9 | 62 | 5.5 | 181 |
| | Outside the Ches. Bay Mouth | 6.0 | 1 | 2.5 | 2 | 4.0 | 5 |
| | Northeast River | 23.7 | 11 | 54.3 | 17 | 31.9 | 44 |
| | Elk/Bohemia Rivers | 18.1 | 34 | 9.9 | 52 | 10.1 | 141 |
| | Sassafras River | 34.3 | 12 | 70.2 | 15 | 47.9 | 45 |
| | Chester River | 8.1 | 46 | 16.0 | 83 | 10.5 | 205 |
| | Eastern Bay | 4.3 | 14 | 10.2 | 23 | 6.6 | 58 |
| | Choptank River | 7.0 | 34 | 17.4 | 57 | 11.2 | 138 |

Table E-1. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by Chesapeake Bay Program segment within decade: 1950s–1990s (continued).

| Decade | Chesapeake Bay Program Segment | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|--------|--------------------------------|-------------|-----|-------------|-----|-------------|-----|
| 1980 | Lower Choptank River | 6.4 | 26 | 9.3 | 44 | 7.0 | 107 |
| | Nanticoke River | 11.4 | 23 | 18.0 | 32 | 13.1 | 90 |
| | Wicomico River | 6.6 | 11 | 19.6 | 16 | 11.3 | 44 |
| | Manokin River | 8.2 | 12 | 13.8 | 16 | 9.0 | 43 |
| | Big Annemessex River | 5.0 | 12 | 10.0 | 16 | 6.5 | 43 |
| | Tangier Sound | 9.5 | 65 | 10.7 | 86 | 8.2 | 237 |
| | Pocomoke River | 4.2 | 12 | 11.2 | 15 | 8.9 | 45 |
| | Bush River | 17.6 | 13 | 42.9 | 22 | 25.3 | 53 |
| | Gunpowder River | 22.3 | 11 | 20.5 | 24 | 17.5 | 53 |
| | Middle River | 14.8 | 11 | 24.2 | 19 | 19.8 | 48 |
| | Back River | 105.5 | 13 | 101.8 | 38 | 83.7 | 87 |
| | Patapsco River | 17.5 | 22 | 50.3 | 44 | 29.3 | 95 |
| | Magothy River | 10.0 | 13 | 22.1 | 19 | 15.0 | 51 |
| | Severn River | 13.0 | 10 | 22.8 | 18 | 16.8 | 47 |
| | South/Rhode/West Rivers | 14.9 | 42 | 23.8 | 58 | 16.5 | 157 |
| | Upper Patuxent River | 4.7 | 94 | 18.4 | 160 | 9.2 | 414 |
| | Middle Patuxent River | 15.5 | 13 | 14.2 | 26 | 17.1 | 65 |
| | Lower Patuxent River | 14.7 | 52 | 11.4 | 95 | 11.4 | 245 |
| | Upper Potomac River | 4.5 | 95 | 15.9 | 121 | 7.9 | 336 |
| | Middle Potomac River | 7.4 | 62 | 7.4 | 79 | 5.8 | 224 |
| | Lower Potomac River | 18.2 | 31 | 10.3 | 43 | 10.7 | 120 |
| | Upper Rappahannock River | 4.1 | 30 | 15.2 | 53 | 8.4 | 124 |
| | Middle Rappahannock River | 22.1 | 24 | 10.8 | 39 | 12.5 | 103 |
| | Lower Rappahannock River | 10.9 | 78 | 8.9 | 120 | 8.3 | 324 |
| | Upper York River | 3.1 | 24 | 5.1 | 40 | 3.8 | 102 |

Table E-1. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by Chesapeake Bay Program segment within decade: 1950s–1990s (continued.)

| Decade | Chesapeake Bay Program Segment | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|--------|--------------------------------|-------------|-----|-------------|-----|-------------|------|
| 1980 | Middle York River | 5.4 | 36 | 11.0 | 60 | 7.0 | 152 |
| | Lower York River | 13.5 | 36 | 8.3 | 59 | 9.7 | 151 |
| | Mobjack Bay | 6.3 | 60 | 8.4 | 80 | 6.9 | 236 |
| | Upper James River | 10.2 | 65 | 20.7 | 114 | 11.2 | 283 |
| | Middle James River | 13.8 | 24 | 17.3 | 40 | 13.7 | 100 |
| | Lower James River | 13.8 | 88 | 6.2 | 140 | 9.6 | 349 |
| 1990 | Northern Chesapeake Bay | 6.6 | 27 | 8.6 | 40 | 5.8 | 102 |
| | Upper Chesapeake Bay | 5.0 | 58 | 6.3 | 79 | 4.2 | 220 |
| | Upper Central Chesapeake Bay | 7.6 | 147 | 14.3 | 200 | 9.0 | 487 |
| | Middle Central Chesapeake Bay | 7.5 | 300 | 9.9 | 400 | 8.1 | 929 |
| | Lower Chesapeake Bay | 9.5 | 210 | 8.5 | 279 | 8.0 | 819 |
| | Western Lower Chesapeake Bay | 7.1 | 118 | 7.5 | 159 | 6.7 | 475 |
| | Eastern Lower Chesapeake Bay | 6.6 | 264 | 6.8 | 359 | 6.5 | 1059 |
| | Mouth of the Chesapeake Bay | 6.3 | 88 | 5.6 | 120 | 5.8 | 354 |
| | Outside the Ches. Bay Mouth | — | — | — | — | — | — |
| | Northeast River | 23.0 | 27 | 53.5 | 38 | 31.4 | 105 |
| | Elk/Bohemia Rivers | 6.9 | 88 | 6.5 | 113 | 5.9 | 326 |
| | Sassafras River | 39.6 | 29 | 66.9 | 35 | 46.1 | 113 |
| | Chester River | 10.6 | 89 | 20.3 | 117 | 13.2 | 350 |
| | Eastern Bay | 8.3 | 30 | 12.8 | 39 | 9.2 | 117 |
| | Choptank River | 13.3 | 60 | 19.9 | 78 | 12.8 | 234 |
| | Lower Choptank River | 7.4 | 60 | 8.4 | 78 | 7.4 | 229 |
| | Nanticoke River | 10.4 | 60 | 26.9 | 74 | 15.5 | 226 |
| | Wicomico River | 8.1 | 29 | 14.3 | 36 | 10.6 | 112 |
| | Manokin River | 11.8 | 30 | 11.2 | 36 | 9.8 | 111 |
| | Big Annemessex River | 7.5 | 30 | 9.6 | 35 | 7.4 | 112 |

Table E-1. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by Chesapeake Bay Program segment within decade: 1950s–1990s (continued).

| Decade | Chesapeake Bay Program Segment | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|--------|--------------------------------|-------------|-----|-------------|-----|-------------|------|
| 1990 | Tangier Sound | 10.8 | 147 | 10.6 | 189 | 9.3 | 566 |
| | Pocomoke River | 2.1 | 30 | 7.5 | 39 | 4.6 | 113 |
| | Bush River | 26.4 | 28 | 50.9 | 37 | 31.0 | 106 |
| | Gunpowder River | 21.5 | 29 | 18.6 | 38 | 17.0 | 106 |
| | Middle River | 20.1 | 29 | 12.8 | 38 | 13.5 | 107 |
| | Back River | 104.2 | 29 | 82.4 | 38 | 75.7 | 107 |
| | Patapsco River | 15.5 | 29 | 36.1 | 39 | 22.3 | 113 |
| | Magothy River | 12.2 | 29 | 18.3 | 37 | 13.6 | 110 |
| | Severn River | 13.2 | 30 | 19.4 | 35 | 14.4 | 109 |
| | South/Rhode/West Rivers | 12.4 | 89 | 18.4 | 110 | 13.0 | 315 |
| | Upper Patuxent River | 5.9 | 234 | 15.9 | 307 | 8.7 | 863 |
| | Middle Patuxent River | 17.8 | 30 | 15.6 | 39 | 15.6 | 118 |
| | Lower Patuxent River | 10.7 | 120 | 13.0 | 156 | 10.4 | 472 |
| | Upper Potomac River | 6.0 | 174 | 20.3 | 233 | 9.8 | 655 |
| | Middle Potomac River | 5.0 | 93 | 8.4 | 121 | 5.6 | 350 |
| | Lower Potomac River | 10.8 | 60 | 9.4 | 80 | 8.7 | 228 |
| | Upper Rappahannock River | 3.6 | 149 | 14.1 | 209 | 7.3 | 563 |
| | Middle Rappahannock River | 9.0 | 66 | 11.0 | 85 | 8.5 | 250 |
| | Lower Rappahannock River | 8.2 | 187 | 7.9 | 250 | 7.1 | 727 |
| | Upper York River | 1.5 | 64 | 4.4 | 79 | 2.5 | 240 |
| | Middle York River | 3.5 | 92 | 13.3 | 118 | 7.4 | 349 |
| | Lower York River | 10.3 | 97 | 7.6 | 125 | 7.6 | 371 |
| | Mobjack Bay | 7.3 | 125 | 8.5 | 167 | 7.3 | 502 |
| | Upper James River | 6.3 | 210 | 16.3 | 284 | 8.9 | 813 |
| | Middle James River | 13.3 | 64 | 14.1 | 85 | 11.1 | 245 |
| | Lower James River | 10.7 | 331 | 7.9 | 447 | 7.7 | 1295 |

Table E-2. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by segment across decades: 1950s–1990s.

| Segment | Decade | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|---------|--------|-------------|-----|-------------|-----|-------------|-----|
| CB1 | 1950 | - | - | - | - | 1.4 | 1 |
| CB1 | 1960 | 6.1 | 8 | 18.2 | 11 | 12.4 | 31 |
| CB1 | 1970 | 11.7 | 28 | 19.3 | 66 | 12.1 | 116 |
| CB1 | 1980 | 7.6 | 20 | 10.9 | 28 | 7.8 | 68 |
| CB1 | 1990 | 6.6 | 27 | 8.6 | 40 | 5.8 | 102 |
| CB2 | 1950 | 1.1 | 1 | - | - | 2.2 | 7 |
| CB2 | 1960 | 7.0 | 10 | 25.9 | 15 | 15.9 | 42 |
| CB2 | 1970 | 9.6 | 26 | 15.4 | 66 | 10.6 | 125 |
| CB2 | 1980 | 8.4 | 38 | 10.1 | 55 | 7.3 | 135 |
| CB2 | 1990 | 5.0 | 58 | 6.3 | 79 | 4.2 | 220 |
| CB3 | 1950 | - | - | 1.7 | 1 | 3.2 | 10 |
| CB3 | 1960 | 6.9 | 29 | 18.2 | 59 | 11.5 | 122 |
| CB3 | 1970 | 14.2 | 156 | 20.7 | 266 | 14.8 | 589 |
| CB3 | 1980 | 11.5 | 87 | 14.7 | 152 | 10.7 | 362 |
| CB3 | 1990 | 7.6 | 147 | 14.3 | 200 | 9.0 | 487 |
| CB4 | 1950 | 3.1 | 3 | 2.1 | 1 | 4.0 | 13 |
| CB4 | 1960 | 3.9 | 18 | 11.1 | 25 | 7.4 | 69 |
| CB4 | 1970 | 11.5 | 99 | 10.5 | 142 | 9.7 | 325 |
| CB4 | 1980 | 10.4 | 155 | 10.7 | 225 | 9.4 | 590 |
| CB4 | 1990 | 7.5 | 300 | 9.9 | 400 | 8.1 | 929 |
| CB5 | 1950 | 14.1 | 3 | 5.6 | 1 | 7.0 | 16 |
| CB5 | 1960 | 2.4 | 7 | 10.9 | 12 | 9.7 | 28 |
| CB5 | 1970 | 11.5 | 29 | 7.7 | 35 | 8.1 | 94 |
| CB5 | 1980 | 10.3 | 111 | 9.0 | 158 | 8.6 | 454 |
| CB5 | 1990 | 9.5 | 210 | 8.5 | 279 | 8.0 | 819 |
| CB6 | 1950 | - | - | - | - | 0.7 | 8 |

Table E-2. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by segment across decades: 1950s–1990s (*continued*).

| Segment | Decade | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|---------|--------|-------------|-----|-------------|-----|-------------|------|
| CB6 | 1960 | - | - | - | - | - | - |
| CB6 | 1970 | - | - | 11.0 | 1 | 11.0 | 1 |
| CB6 | 1980 | 7.2 | 60 | 8.7 | 80 | 7.6 | 236 |
| CB6 | 1990 | 7.1 | 118 | 7.5 | 159 | 6.7 | 475 |
| CB7 | 1950 | 7.9 | 3 | - | - | 4.2 | 19 |
| CB7 | 1960 | 5.5 | 1 | 1.2 | 2 | 2.0 | 5 |
| CB7 | 1970 | 14.7 | 13 | 4.8 | 17 | 7.3 | 45 |
| CB7 | 1980 | 6.2 | 140 | 5.8 | 187 | 6.5 | 543 |
| CB7 | 1990 | 6.6 | 264 | 6.8 | 359 | 6.5 | 1059 |
| CB8 | 1950 | - | - | - | - | 1.6 | 8 |
| CB8 | 1960 | - | - | - | - | - | - |
| CB8 | 1970 | 14.8 | 4 | 7.7 | 14 | 8.7 | 29 |
| CB8 | 1980 | 5.8 | 45 | 4.9 | 62 | 5.5 | 181 |
| CB8 | 1990 | 6.3 | 88 | 5.6 | 120 | 5.8 | 354 |
| MOUTH | 1950 | - | - | 2.0 | 1 | 2.2 | 2 |
| MOUTH | 1960 | 1.1 | 2 | 0.8 | 4 | 1.0 | 8 |
| MOUTH | 1970 | 5.1 | 7 | 3.5 | 8 | 4.2 | 31 |
| MOUTH | 1980 | 6.0 | 1 | 2.5 | 2 | 4.0 | 5 |
| MOUTH | 1990 | - | - | - | - | - | - |
| ET1 | 1950 | - | - | - | - | - | - |
| ET1 | 1960 | - | - | - | - | - | - |
| ET1 | 1970 | 40.0 | 11 | 54.9 | 35 | 49.0 | 53 |
| ET1 | 1980 | 23.7 | 11 | 54.3 | 17 | 31.9 | 44 |
| ET1 | 1990 | 23.0 | 27 | 53.5 | 38 | 31.4 | 105 |
| ET2 | 1950 | - | - | - | - | - | - |
| ET2 | 1960 | - | - | - | - | - | - |

Table E-2. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by segment across decades: 1950s–1990s (continued).

| Segment | Decade | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|---------|--------|-------------|-----|-------------|-----|-------------|-----|
| ET2 | 1970 | 27.3 | 62 | 28.8 | 136 | 25.9 | 248 |
| ET2 | 1980 | 18.1 | 34 | 9.9 | 52 | 10.1 | 141 |
| ET2 | 1990 | 6.9 | 88 | 6.5 | 113 | 5.9 | 326 |
| ET3 | 1950 | - | - | - | - | - | - |
| ET3 | 1960 | - | - | 18.1 | 3 | 20.8 | 5 |
| ET3 | 1970 | 42.2 | 26 | 43.1 | 61 | 46.8 | 106 |
| ET3 | 1980 | 34.3 | 12 | 70.2 | 15 | 47.9 | 45 |
| ET3 | 1990 | 39.6 | 29 | 66.9 | 35 | 46.1 | 113 |
| ET4 | 1950 | - | - | - | - | - | - |
| ET4 | 1960 | 5.2 | 11 | 8.7 | 14 | 5.6 | 36 |
| ET4 | 1970 | 18.2 | 42 | 25.6 | 84 | 22.7 | 159 |
| ET4 | 1980 | 8.1 | 46 | 16.0 | 83 | 10.5 | 205 |
| ET4 | 1990 | 10.6 | 89 | 20.3 | 117 | 13.2 | 350 |
| EE1 | 1950 | - | - | 0.5 | 1 | 1.5 | 3 |
| EE1 | 1960 | 5.3 | 27 | 9.2 | 39 | 6.5 | 94 |
| EE1 | 1970 | 6.5 | 84 | 21.7 | 89 | 14.0 | 226 |
| EE1 | 1980 | 4.3 | 14 | 10.2 | 23 | 6.6 | 58 |
| EE1 | 1990 | 8.3 | 30 | 12.8 | 39 | 9.2 | 117 |
| ET5 | 1950 | 2.4 | 2 | 3.4 | 3 | 2.8 | 7 |
| ET5 | 1960 | - | - | - | - | - | - |
| ET5 | 1970 | 18.4 | 99 | 17.1 | 121 | 18.8 | 276 |
| ET5 | 1980 | 7.0 | 34 | 17.4 | 57 | 11.2 | 138 |
| ET5 | 1990 | 13.3 | 60 | 19.9 | 78 | 12.8 | 234 |
| EE2 | 1950 | 6.9 | 1 | 1.7 | 3 | 2.6 | 5 |
| EE2 | 1960 | - | - | - | - | - | - |
| EE2 | 1970 | 11.1 | 37 | 21.5 | 60 | 17.2 | 103 |

Table E-2. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by segment across decades: 1950s–1990s (continued).

| Segment | Decade | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|---------|--------|-------------|-----|-------------|-----|-------------|-----|
| EE2 | 1980 | 6.4 | 26 | 9.3 | 44 | 7.0 | 107 |
| EE2 | 1990 | 7.4 | 60 | 8.4 | 78 | 7.4 | 229 |
| EE3 | 1950 | - | - | 11.8 | 1 | 4.3 | 8 |
| EE3 | 1960 | - | - | - | - | - | - |
| EE3 | 1970 | 20.3 | 37 | 16.6 | 57 | 27.6 | 113 |
| EE3 | 1980 | 9.5 | 65 | 10.7 | 86 | 8.2 | 237 |
| EE3 | 1990 | 10.8 | 147 | 10.6 | 189 | 9.3 | 566 |
| ET6 | 1950 | - | - | - | - | - | - |
| ET6 | 1960 | - | - | - | - | - | - |
| ET6 | 1970 | 32.5 | 37 | 22.9 | 80 | 26.7 | 168 |
| ET6 | 1980 | 11.4 | 23 | 18.0 | 32 | 13.1 | 90 |
| ET6 | 1990 | 10.4 | 60 | 26.9 | 74 | 15.5 | 226 |
| ET7 | 1950 | - | - | - | - | - | - |
| ET7 | 1960 | - | - | - | - | - | - |
| ET7 | 1970 | 36.7 | 31 | 41.9 | 42 | 31.4 | 101 |
| ET7 | 1980 | 6.6 | 11 | 19.6 | 16 | 11.3 | 44 |
| ET7 | 1990 | 8.1 | 29 | 14.3 | 36 | 10.6 | 112 |
| ET8 | 1950 | - | - | - | - | - | - |
| ET8 | 1960 | - | - | - | - | - | - |
| ET8 | 1970 | 15.5 | 3 | 7.2 | 5 | 12.2 | 8 |
| ET8 | 1980 | 8.2 | 12 | 13.8 | 16 | 9.0 | 43 |
| ET8 | 1990 | 11.8 | 30 | 11.2 | 36 | 9.8 | 111 |
| ET9 | 1950 | - | - | - | - | - | - |
| ET9 | 1960 | - | - | - | - | - | - |
| ET9 | 1970 | - | - | 18.2 | 6 | 18.2 | 6 |
| ET9 | 1980 | 5.0 | 12 | 10.0 | 16 | 6.5 | 43 |

Table E-2. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by segment across decades: 1950s–1990s (continued).

| Segment | Decade | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|---------|--------|-------------|-----|-------------|-----|-------------|-----|
| ET9 | 1990 | 7.5 | 30 | 9.6 | 35 | 7.4 | 112 |
| ET10 | 1950 | - | - | - | - | - | - |
| ET10 | 1960 | - | - | - | - | - | - |
| ET10 | 1970 | 23.1 | 43 | 19.0 | 63 | 19.9 | 146 |
| ET10 | 1980 | 4.2 | 12 | 11.2 | 15 | 8.9 | 45 |
| ET10 | 1990 | 2.1 | 30 | 7.5 | 39 | 4.6 | 113 |
| WT1 | 1950 | - | - | - | - | - | - |
| WT1 | 1960 | - | - | - | - | - | - |
| WT1 | 1970 | 7.3 | 4 | 13.2 | 12 | 10.1 | 25 |
| WT1 | 1980 | 17.6 | 13 | 42.9 | 22 | 25.3 | 53 |
| WT1 | 1990 | 26.4 | 28 | 50.9 | 37 | 31.0 | 106 |
| WT2 | 1950 | - | - | - | - | - | - |
| WT2 | 1960 | - | - | - | - | - | - |
| WT2 | 1970 | 7.6 | 24 | 7.3 | 39 | 9.7 | 94 |
| WT2 | 1980 | 22.3 | 11 | 20.5 | 24 | 17.5 | 53 |
| WT2 | 1990 | 21.5 | 29 | 18.6 | 38 | 17.0 | 106 |
| WT3 | 1950 | - | - | - | - | - | - |
| WT3 | 1960 | - | - | - | - | - | - |
| WT3 | 1970 | 14.7 | 8 | 28.2 | 8 | 17.7 | 19 |
| WT3 | 1980 | 14.8 | 11 | 24.2 | 19 | 19.8 | 48 |
| WT3 | 1990 | 20.1 | 29 | 12.8 | 38 | 13.5 | 107 |
| WT4 | 1950 | - | - | - | - | - | - |
| WT4 | 1960 | - | - | 7.7 | 1 | 30.9 | 3 |
| WT4 | 1970 | 55.7 | 115 | 61.5 | 167 | 58.3 | 392 |
| WT4 | 1980 | 105.5 | 13 | 101.8 | 38 | 83.7 | 87 |
| WT4 | 1990 | 104.2 | 29 | 82.4 | 38 | 75.7 | 107 |

Table E-2. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by segment across decades: 1950s–1990s (continued).

| Segment | Decade | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|---------|--------|-------------|-----|-------------|-----|-------------|-----|
| WT5 | 1950 | - | - | - | - | 7.5 | 1 |
| WT5 | 1960 | 18.7 | 17 | 47.1 | 41 | 41.9 | 64 |
| WT5 | 1970 | 14.1 | 36 | 40.9 | 77 | 23.4 | 162 |
| WT5 | 1980 | 17.5 | 22 | 50.3 | 44 | 29.3 | 95 |
| WT5 | 1990 | 15.5 | 29 | 36.1 | 39 | 22.3 | 113 |
| WT6 | 1950 | - | - | - | - | - | - |
| WT6 | 1960 | 8.6 | 13 | 12.5 | 21 | 11.5 | 56 |
| WT6 | 1970 | 33.8 | 40 | 37.8 | 50 | 32.7 | 129 |
| WT6 | 1980 | 10.0 | 13 | 22.1 | 19 | 15.0 | 51 |
| WT6 | 1990 | 12.2 | 29 | 18.3 | 37 | 13.6 | 110 |
| WT7 | 1950 | - | - | - | - | - | - |
| WT7 | 1960 | 7.1 | 12 | 15.9 | 22 | 10.8 | 60 |
| WT7 | 1970 | 22.2 | 12 | 32.1 | 43 | 24.8 | 75 |
| WT7 | 1980 | 13.0 | 10 | 22.8 | 18 | 16.8 | 47 |
| WT7 | 1990 | 13.2 | 30 | 19.4 | 35 | 14.4 | 109 |
| WT8 | 1950 | - | - | - | - | - | - |
| WT8 | 1960 | 6.3 | 17 | 15.4 | 38 | 11.1 | 73 |
| WT8 | 1970 | 25.2 | 31 | 29.7 | 84 | 29.4 | 157 |
| WT8 | 1980 | 14.9 | 42 | 23.8 | 58 | 16.5 | 157 |
| WT8 | 1990 | 12.4 | 89 | 18.4 | 110 | 13.0 | 315 |
| TF1 | 1950 | 2.6 | 1 | 1.7 | 2 | 1.7 | 4 |
| TF1 | 1960 | 20.1 | 18 | 32.0 | 43 | 22.5 | 65 |
| TF1 | 1970 | 10.9 | 37 | 15.8 | 68 | 14.3 | 147 |
| TF1 | 1980 | 4.7 | 94 | 18.4 | 160 | 9.2 | 414 |
| TF1 | 1990 | 5.9 | 234 | 15.9 | 307 | 8.7 | 863 |
| RET1 | 1950 | - | - | 2.1 | 2 | 2.9 | 3 |

Table E-2. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by segment across decades: 1950s–1990s (continued).

| Segment | Decade | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|---------|--------|-------------|-----|-------------|-----|-------------|-----|
| RET1 | 1960 | 15.0 | 2 | 24.8 | 4 | 21.5 | 6 |
| RET1 | 1970 | 31.3 | 2 | 18.1 | 8 | 16.8 | 14 |
| RET1 | 1980 | 15.5 | 13 | 14.2 | 26 | 17.1 | 65 |
| RET1 | 1990 | 17.8 | 30 | 15.6 | 39 | 15.6 | 118 |
| LE1 | 1950 | 5.3 | 3 | 3.3 | 4 | 2.6 | 14 |
| LE1 | 1960 | 19.9 | 2 | 20.5 | 4 | 20.3 | 6 |
| LE1 | 1970 | 10.9 | 4 | 15.7 | 5 | 11.5 | 12 |
| LE1 | 1980 | 14.7 | 52 | 11.4 | 95 | 11.4 | 245 |
| LE1 | 1990 | 10.7 | 120 | 13.0 | 156 | 10.4 | 472 |
| TF2 | 1950 | - | - | - | - | - | - |
| TF2 | 1960 | 24.3 | 50 | 59.1 | 81 | 38.7 | 176 |
| TF2 | 1970 | 17.9 | 142 | 31.0 | 286 | 18.0 | 559 |
| TF2 | 1980 | 4.5 | 95 | 15.9 | 121 | 7.9 | 336 |
| TF2 | 1990 | 6.0 | 174 | 20.3 | 233 | 9.8 | 655 |
| RET2 | 1950 | - | - | 26.7 | 1 | 26.7 | 1 |
| RET2 | 1960 | 8.1 | 26 | 29.3 | 35 | 23.6 | 83 |
| RET2 | 1970 | 20.0 | 78 | 19.3 | 142 | 16.6 | 288 |
| RET2 | 1980 | 7.4 | 62 | 7.4 | 79 | 5.8 | 224 |
| RET2 | 1990 | 5.0 | 93 | 8.4 | 121 | 5.6 | 350 |
| LE2 | 1950 | 10.8 | 2 | 5.0 | 12 | 6.1 | 23 |
| LE2 | 1960 | 8.5 | 24 | 18.7 | 33 | 13.7 | 76 |
| LE2 | 1970 | 8.0 | 40 | 8.9 | 65 | 11.2 | 140 |
| LE2 | 1980 | 18.2 | 31 | 10.3 | 43 | 10.7 | 120 |
| LE2 | 1990 | 10.8 | 60 | 9.4 | 80 | 8.7 | 228 |
| TF3 | 1950 | - | - | - | - | - | - |
| TF3 | 1960 | - | - | - | - | - | - |

Table E-2. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by segment across decades: 1950s–1990s (*continued*).

| Segment | Decade | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|---------|--------|-------------|-----|-------------|-----|-------------|-----|
| TF3 | 1970 | 2.1 | 66 | 9.4 | 142 | 5.7 | 313 |
| TF3 | 1980 | 4.1 | 30 | 15.2 | 53 | 8.4 | 124 |
| TF3 | 1990 | 3.6 | 149 | 14.1 | 209 | 7.3 | 563 |
| RET3 | 1950 | - | - | - | - | 3.7 | 2 |
| RET3 | 1960 | - | - | - | - | - | - |
| RET3 | 1970 | 6.4 | 13 | 6.6 | 29 | 5.6 | 65 |
| RET3 | 1980 | 22.1 | 24 | 10.8 | 39 | 12.5 | 103 |
| RET3 | 1990 | 9.0 | 66 | 11.0 | 85 | 8.5 | 250 |
| LE3 | 1950 | 8.2 | 1 | - | - | 4.3 | 6 |
| LE3 | 1960 | - | - | - | - | - | - |
| LE3 | 1970 | 6.8 | 14 | 8.0 | 35 | 7.5 | 76 |
| LE3 | 1980 | 10.9 | 78 | 8.9 | 120 | 8.3 | 324 |
| LE3 | 1990 | 8.2 | 187 | 7.9 | 250 | 7.1 | 727 |
| TF4 | 1950 | - | - | - | - | - | - |
| TF4 | 1960 | - | - | - | - | - | - |
| TF4 | 1970 | 3.9 | 18 | 9.8 | 107 | 7.2 | 170 |
| TF4 | 1980 | 3.1 | 24 | 5.1 | 40 | 3.8 | 102 |
| TF4 | 1990 | 1.5 | 64 | 4.4 | 79 | 2.5 | 240 |
| RET4 | 1950 | - | - | - | - | 2.0 | 1 |
| RET4 | 1960 | - | - | - | - | - | - |
| RET4 | 1970 | 5.0 | 24 | 9.8 | 109 | 7.2 | 167 |
| RET4 | 1980 | 5.4 | 36 | 11.0 | 60 | 7.0 | 152 |
| RET4 | 1990 | 3.5 | 92 | 13.3 | 118 | 7.4 | 349 |
| LE4 | 1950 | 4.5 | 1 | - | - | 1.8 | 3 |
| LE4 | 1960 | - | - | - | - | - | - |
| LE4 | 1970 | 7.8 | 8 | 5.7 | 21 | 5.8 | 35 |

Table E-2. Chesapeake Bay and tidal tributaries chlorophyll a concentrations ($\mu\text{g liter}^{-1}$) by segment across decades: 1950s–1990s (*continued*).

| Segment | Decade | Spring Mean | (N) | Summer Mean | (N) | Annual Mean | (N) |
|---------|--------|-------------|-----|-------------|-----|-------------|------|
| LE4 | 1980 | 13.5 | 36 | 8.3 | 59 | 9.7 | 151 |
| LE4 | 1990 | 10.3 | 97 | 7.6 | 125 | 7.6 | 371 |
| WE4 | 1950 | - | - | - | - | 0.6 | 2 |
| WE4 | 1960 | - | - | - | - | - | - |
| WE4 | 1970 | 8.3 | 16 | 7.4 | 42 | 6.5 | 69 |
| WE4 | 1980 | 6.3 | 60 | 8.4 | 80 | 6.9 | 236 |
| WE4 | 1990 | 7.3 | 125 | 8.5 | 167 | 7.3 | 502 |
| TF5 | 1950 | - | - | - | - | - | - |
| TF5 | 1960 | - | - | - | - | - | - |
| TF5 | 1970 | 5.5 | 55 | 8.9 | 187 | 5.2 | 345 |
| TF5 | 1980 | 10.2 | 65 | 20.7 | 114 | 11.2 | 283 |
| TF5 | 1990 | 6.3 | 210 | 16.3 | 284 | 8.9 | 813 |
| RET5 | 1950 | - | - | - | - | - | - |
| RET5 | 1960 | - | - | - | - | - | - |
| RET5 | 1970 | 7.7 | 19 | 4.6 | 75 | 4.6 | 137 |
| RET5 | 1980 | 13.8 | 24 | 17.3 | 40 | 13.7 | 100 |
| RET5 | 1990 | 13.3 | 64 | 14.1 | 85 | 11.1 | 245 |
| LE5 | 1950 | - | - | 3.3 | 19 | 2.3 | 28 |
| LE5 | 1960 | 12.8 | 2 | - | - | 12.8 | 2 |
| LE5 | 1970 | 7.6 | 9 | 3.8 | 43 | 3.6 | 73 |
| LE5 | 1980 | 13.8 | 88 | 6.2 | 140 | 9.6 | 349 |
| LE5 | 1990 | 10.7 | 331 | 7.9 | 447 | 7.7 | 1295 |